

Comparison of Postural Recovery Following Short and Long Duration Spaceflights

S. J. Wood,^{1,2} J. Fiedler,^{1,2} L. C. Taylor,^{1,3}
I. Kozlovskaya,⁴ F. O. Black⁵ and W. H. Paloski^{1,6}

¹ NASA Johnson Space Center, Houston TX,

² Universities Space Research Association, Houston TX,

³ Wyle Integrated Science and Engineering Group, Houston, TX

⁴ Institute of Biomedical Problems, Moscow Russia,

⁵ Legacy Health System, Portland OR

and ⁶ University of Houston, Houston TX

INTRODUCTION. Post-flight postural ataxia reflects adaptive changes to vestibulo-spinal reflexes and control strategies adopted for movement in weightlessness. Quantitative measures obtained during computerized dynamic posturography (CDP) from US and Russian programs provide insight into the effect of spaceflight duration in terms of both the initial decrements and recovery of postural stability. **METHODS.** CDP was obtained on 117 crewmembers following Shuttle flights lasting 4-17 days, and on 64 crewmembers following long-duration missions lasting 48-380 days. Although the number and timing of sessions varied, the goal was to characterize postural recovery pooling similar measures from different research and flight medicine programs. This report focuses on eyes closed, head erect conditions with either a fixed or sway-referenced base of support. A smaller subset of subjects repeated the sway-referenced condition while making pitch head movements ($\pm 20^\circ$ at 0.33Hz). Equilibrium scores were derived from peak-to-peak anterior-posterior sway. Fall probability was modeled using Bayesian statistical methods to estimate parameters of a logit function. **RESULTS.** The standard Romberg condition was the least sensitive. Longer duration flights led to larger decrements in stability with sway-reference support during the first 1-2 days, although the timecourse of recovery was similar across flight duration with head erect. Head movements led to increased incidence of falls during the first week, with a significantly longer recovery following long duration flights. **CONCLUSIONS.** The diagnostic assessment of postural instability, and differences in the timecourse of postural recovery between short and long flight durations, are more pronounced during unstable support conditions requiring active head movements.